WHAT IS CLAIMED IS:

1. An apparatus of a digital echo canceller that is suitable to use on a full-duplex digital echo transceiver and is used to cancel a produced echo signal, the apparatus comprises:

a plurality of first-set delay circuits installed, wherein each delay circuit has an input and an output, and are all connected in series, and the first input receives an input signal that transmitted from the full-duplex digital transceiver, and the first-set delay circuits are arranged in groups and each group has N delay circuits;

a selector with an input and an output, wherein the input is based on an exhaustive search that chooses to connect to one the outputs of the first delay circuits;

a plurality of second-set delay circuits, wherein each circuit has an input and an output and are all connected in series, and the first input is connected to the output of the selector;

a plurality of multipliers wherein the number of the multipliers is the same as the number of the second-set delay circuits, and the multipliers are connected respectively to the outputs of the second-set delay circuits, and the transmitting signals from the second-set delay circuits are multiplied respectively to correlation coefficients;

an adder that adds the results from the multiplication operation together to produce an estimated echo signal, wherein the estimated echo signal cancels the echo signal.

2. The apparatus of claim1, wherein the exhaustive search function depends on a largest energy sum that is produced from the outputs of each group of delay circuits to select an output to connect to the selector.

3. The apparatus of claim 2, wherein the energy sum is calculated from an equation $E(s)=\sum_{i=1}^{N_s} ci^2(s)$, wherein E(s) is an energy sum of EC, and Ci(s) is an EC

coefficient, N_s is the response number of the echo signal and a value of N_s is the same as the number of second-set delay circuits.

4. The apparatus of claim 3, wherein the value of N_s is set at 20.

5. A method of a digital canceller that is suitable for a full-duplex digital transceiver and is used to cancel an echo signal, with a first receiving end connected to a second receiving end by a cable, and the first receiving end transmits an input signal, the steps of the method comprise:

(a) calculating total number of searching S by using a $N_{is,\max}$ value and a ΔN value, wherein $N_{is,\max}$ is the largest response number of the insignificant part of the response signal and ΔN is an incremental number, $N_{is,\max}$ found first; the value ΔN is determined from the value of $N_{is,\max}$, and once these two values are known, the total number of searching S can be calculated;

(b) using an equation $N_{is}(s) = s * \Delta N$ to search for a starting point of the echo response, wherein ΔN is assumed to be 10 and the value of s starts from 0, and once the starting point of the echo response $N_{is}(s)$ is found, the response number of searching N_s can be determined; the N_s value is used to calculate the energy sum of EC from an energy equation $E(s) = \sum_{i=1}^{N_s} ci^2(s)$, wherein E(s) is the energy sum of EC, and Ci(s) is the EC coefficient;

(c) calculating the value of S in step (a) and using the S value as a reference to determine the value of s in order to get s = S, the calculation process has to repeat step (b) until s = S and $N_{is}(s) = N_{is,\max}$;

(d) calculating the largest energy sum during each searching is chosen for the

significant part;

(e) multiplying the values of the significant part to corresponding correlation coefficients, and the results of this multiplication operation are then added together to give an estimated echo signal that will cancel the echo signal.

6. The method of claim 5, wherein the value of ΔN is set at 10, and the value of N_s is set at 20.